



1. A printing apparatus for applying a marking material to a final substrate, said printing apparatus comprising: (a) an intermediate transfer member; (b) an intermediate transfer material applicator for transferring intermediate transfer material from a solid block of intermediate transfer material to form a molten layer of intermediate transfer material on the intermediate transfer member; (c) a marking material applicator situated to apply marking material in an imagewise pattern to the molten layer of intermediate transfer material on the intermediate transfer member; and (d) a transferring apparatus to transfer the imagewise pattern of marking material to a final recording substrate.

2. An apparatus according to claim 1 wherein the intermediate transfer material applicator comprises a holder for holding the block of intermediate transfer material in contact with the intermediate transfer member to apply the molten layer of intermediate transfer material to the intermediate transfer member.

3. An apparatus according to claim 2 wherein the holder is movable between an engaged position and a disengaged position.

4. An apparatus according to claim 3 wherein when the holder is in the engaged position, a block of intermediate transfer material in the holder contacts the intermediate transfer member.

5. An apparatus according to claim 2 further comprising a retractor for moving the holder between an engaged position and a disengaged position.

6. An apparatus according to claim 1 wherein the intermediate transfer material applicator is mounted so that the block of intermediate transfer material can be moved into and out of contact with the intermediate transfer member.

7. An apparatus according to claim 1 further comprising a heater to heat the intermediate transfer member to a temperature of at least about 40°C.

8. An apparatus according to claim 7 wherein the heater heats said intermediate transfer member to a temperature of at least about 50°C.

9. An apparatus according to claim 7 wherein the heater heats said intermediate transfer member to a temperature of at least about 60°C.

10. An apparatus according to claim 1 wherein the applicator is configured to apply the molten layer of intermediate transfer material on the intermediate transfer member to a thickness of at least about 0.05 micron.

11. An apparatus according to claim 1 wherein the applicator is configured to apply the molten layer of intermediate transfer material on the intermediate transfer member to a thickness of at least about 0.1 micron.

12. An apparatus according to claim 1 wherein the applicator is configured to apply the molten layer of intermediate transfer material on the intermediate transfer member to a thickness of at least about 1 micron.

13. An apparatus according to claim 1 wherein the applicator is configured to apply the molten layer of intermediate transfer material on the intermediate transfer member to a thickness of no more than about 60 microns.

14. An apparatus according to claim 1 wherein the applicator is configured to apply the molten layer of intermediate transfer material on the intermediate transfer member to a thickness of no more than about 50 microns.

15. An apparatus according to claim 1 wherein the applicator is configured to apply the molten layer of intermediate transfer material on the intermediate transfer member to a thickness of no more than about 10 microns.

16. An apparatus according to claim 1 additionally comprising a substrate heater situated to heat the final recording substrate prior to transfer of the imagewise pattern of marking material thereto.

17. An apparatus according to claim 16 wherein the substrate heater heats the final recording substrate to a temperature of at least about 60°C.

18. An apparatus according to claim 16 wherein the substrate heater heats the final recording substrate to a temperature of at least about 65°C.

19. An apparatus according to claim 1 wherein the apparatus further comprises a blade for metering the molten layer of intermediate transfer material on the intermediate transfer member to a substantially uniform thickness.

20. An apparatus according to claim 1 wherein the transferring apparatus transfers a quantity of the intermediate transfer material to the final recording substrate, said apparatus further comprising a curing station to cure at least one reactive material in the intermediate transfer material on the final substrate.

21. An apparatus according to claim 20 wherein the curing station applies radiation to the intermediate transfer material on the final substrate.

22. An apparatus according to claim 21 wherein the radiation is ultraviolet radiation.

23. An apparatus according to claim 21 wherein the radiation is infrared radiation.

24. An apparatus according to claim 21 wherein the radiation is light in the visible wavelength range.

25. An apparatus according to claim 21 wherein the radiation is e-beam radiation.

26. An apparatus according to claim 21 wherein the radiation is X-ray radiation.

27. An apparatus according to claim 21 wherein the radiation is heat.

28. An apparatus according to claim 1 wherein the marking material applicator employs a phase change ink jet printing process.

29. An apparatus according to claim 1 wherein the marking material applicator applies an ink that is liquid at room temperature.

30. An apparatus according to claim 1 wherein the marking material applicator employs a thermal ink jet printing process.

31. An apparatus according to claim 1 wherein the marking material applicator employs a piezoelectric ink jet printing process.

32. An apparatus according to claim 1 wherein the intermediate transfer member is a drum.

33. An apparatus according to claim 1 further comprising a block of intermediate transfer material.

34. An apparatus according to claim 33 wherein the block of intermediate transfer material has at least one surface that substantially conforms in shape to that of the intermediate transfer member.

35. An apparatus according to claim 1 further comprising a biasing mechanism to maintain contact between the block of intermediate transfer material and the intermediate transfer member as the block is consumed.

36. A printing process which comprises (a) supplying an intermediate transfer material, said intermediate transfer material having a melting point of at least about 30°C, said intermediate transfer material having a melting point of no more than about 90°C; (b) applying a molten layer of said intermediate transfer material to an intermediate transfer member; (c) applying to the layer of intermediate transfer material a marking material in an imagewise pattern, thereby forming an image on the layer of molten intermediate transfer material; and (d) transferring the marking material from the intermediate transfer member to a final recording substrate.

37. A process according to claim 36 wherein transferring the marking material from the intermediate transfer member to the final recording substrate additionally transfers a quantity of the intermediate transfer material to the final recording substrate as an outer layer thereon.

38. A process according to claim 37 wherein the thickness of the outer layer of intermediate transfer material on the final recording substrate is at least about 0.1 nanometer.

39. A process according to claim 37 wherein the thickness of the outer layer of intermediate transfer material on the final recording substrate is at least about 1 nanometer.

40. A process according to claim 37 wherein the thickness of the outer layer of intermediate transfer material on the final recording substrate is no more than about 100 nanometers.

41. A process according to claim 37 wherein the thickness of the outer layer of intermediate transfer material on the final recording substrate is no more than about 10 nanometers.

42. A process according to claim 37 wherein the mass of the outer layer of intermediate transfer material on the final recording substrate is at least about 0.1 milligram per page.

43. A process according to claim 37 wherein the mass of the outer layer of intermediate transfer material on the final recording substrate is at least about 0.5 milligram per page.

44. A process according to claim 37 wherein the mass of the outer layer of intermediate transfer material on the final recording substrate is at least about 1 milligram per page.

45. A process according to claim 37 wherein the mass of the outer layer of intermediate transfer material on the final recording substrate is no more than about 200 milligrams per page.

46. A process according to claim 37 wherein the mass of the outer layer of intermediate transfer material on the final recording substrate is no more than about 50 milligrams per page.

47. A process according to claim 37 wherein the mass of the outer layer of intermediate transfer material on the final recording substrate is no more than about 10 milligrams per page.

48. A process according to claim 37 further comprising curing at least one reactive material in the intermediate transfer material on the final recording substrate.

49. A process according to claim 48 wherein curing the reactive material comprises applying radiation to the intermediate transfer material on the final recording substrate.

50. A process according to claim 49 wherein the radiation comprises ultraviolet radiation.

~~51~~
~~52.~~ A process according to claim 49 wherein the radiation comprises infrared radiation.

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~~53.~~ A process according to claim 49 wherein the radiation comprises light in the visible wavelength range.

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~~54.~~ A process according to claim 49 wherein the radiation comprises e-beam radiation.

~~54~~
~~55.~~ A process according to claim 49 wherein the radiation comprises X-ray radiation.

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~~56.~~ A process according to claim 49 wherein the radiation comprises heat.

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~~57.~~

A process according to claim 36 wherein the molten layer of intermediate transfer material on the intermediate transfer member has a thickness of at least about 0.05 micron.

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~~58.~~

A process according to claim 36 wherein the molten layer of intermediate transfer material on the intermediate transfer member has a thickness of at least about 0.1 micron.

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~~59.~~

A process according to claim 36 wherein the molten layer of intermediate transfer material on the intermediate transfer member has a thickness of at least about 1 micron.

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A process according to claim 36 wherein the molten layer of intermediate transfer material on the intermediate transfer member has a thickness of no more than about 60 microns.

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~~61.~~

A process according to claim 36 wherein the molten layer of intermediate transfer material on the intermediate transfer member has a thickness of no more than about 50 microns.

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~~62.~~

A process according to claim 36 wherein the molten layer of intermediate transfer material on the intermediate transfer member has a thickness of no more than about 10 microns.

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~~63.~~

A process according to claim 36 wherein applying the molten layer of the intermediate transfer material to the intermediate transfer member comprises heating the intermediate transfer material.

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~~64.~~ A process according to claim ~~63~~⁶² wherein heating the intermediate transfer material comprises heating the intermediate transfer member and bringing a block of the intermediate transfer material into contact with the intermediate transfer member.

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~~65.~~ A process according to claim 36 further comprising heating the intermediate transfer member.

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~~66.~~ A process according to claim ~~65~~⁶⁴ wherein heating the intermediate transfer member comprises heating said intermediate transfer member to a temperature of at least about 50°C.

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~~67.~~ A process according to claim ~~66~~⁶⁴ wherein heating the intermediate transfer member comprises heating said intermediate transfer member to a temperature of at least about 60°C.

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~~68.~~ A process according to claim ~~67~~⁶⁴ wherein heating the intermediate transfer member comprises heating said intermediate transfer member to a temperature of no more than about 120°C.

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~~69.~~ A process according to claim ~~68~~⁶⁴ wherein heating the intermediate transfer member comprises heating said intermediate transfer member to a temperature of no more than about 100°C.

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~~70.~~ A process according to claim ~~69~~⁶⁴ wherein heating the intermediate transfer member comprises heating said intermediate transfer member to a temperature of no more than about 80°C.

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~~71.~~ A process according to claim ~~65~~ wherein heating the intermediate transfer member comprises heating said intermediate transfer member to a temperature of no more than about 70°C.

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~~72.~~ A process according to claim 36 additionally comprising heating the final recording substrate prior to transfer of the imagewise pattern of marking material thereto.

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~~73.~~ A process according to claim ~~72~~ wherein heating the final recording substrate comprises heating the final recording substrate to a temperature of at least about 60°C.

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~~74.~~ A process according to claim ~~72~~ wherein heating the final recording substrate comprises heating the final recording substrate to a temperature of at least about 65°C.

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~~75.~~ A process according to claim ~~72~~ wherein heating the final recording substrate comprises heating the final recording substrate to a temperature of no more than about 80°C.

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~~76.~~ A process according to claim ~~72~~ wherein heating the final recording substrate comprises heating the final recording substrate to a temperature of no more than about 70°C.

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~~77.~~ A process according to claim 36 additionally comprising selectively moving the block of intermediate transfer material into contact with the intermediate transfer member.

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~~78.~~ A process according to claim 36 additionally comprising metering the molten layer of intermediate transfer material on the intermediate transfer member to a substantially uniform thickness.

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~~79.~~ A process according to claim ~~78~~ wherein metering the molten layer of intermediate transfer material comprises using a blade to meter the molten layer of intermediate transfer material.

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~~80.~~ A process according to claim 36 wherein the marking material applicator employs a phase change ink jet printing process.

~~80~~
~~81.~~ A process according to claim 36 wherein the marking material applicator applies an ink that is liquid at room temperature.

~~81~~
~~82.~~ A process according to claim 36 wherein the marking material applicator employs a thermal ink jet printing process.

~~82~~
~~83.~~ A process according to claim 36 wherein the marking material applicator employs a piezoelectric ink jet printing process.

~~83~~
~~84.~~ A process according to claim 36 wherein the intermediate transfer member is a drum.

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~~85.~~ A process according to claim 36 wherein supplying an intermediate transfer material comprises supplying a block of intermediate transfer material, and wherein applying a molten layer of intermediate transfer material comprises melting a portion of the block of intermediate transfer material onto the surface of the intermediate transfer member.

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~~86.~~ A process according to claim ~~85~~ additionally comprising conforming a surface of the block of intermediate transfer material substantially in shape to that of the intermediate transfer member.

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~~87.~~ A process according to claim 36 wherein the intermediate transfer material is in the form of a block, said process additionally comprising biasing the block of intermediate transfer material against a surface of the intermediate transfer member.

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~~88.~~ An applicator for applying intermediate transfer material to an intermediate transfer member of a printing apparatus, said applicator comprising (a) a holder for holding a block of intermediate transfer material; and (b) a biasing mechanism for biasing the holder toward the intermediate transfer member of the printing apparatus.

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~~89.~~

An applicator according to claim 88 wherein the holder has an engaged position and a disengaged position, and wherein the applicator further comprises a retractor for selectively moving the holder between the engaged position and the disengaged position.

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An applicator according to claim ~~89~~ wherein when the holder is in the engaged position, the biasing mechanism biases the holder so that a block of intermediate transfer material in the holder contacts the surface of the intermediate transfer member.

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A process according to claim 37 wherein transfer of the intermediate transfer material to the final recording substrate occurs only in image areas of the final recording substrate.

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~~92.~~

A process according to claim 37 wherein transfer of the intermediate transfer material to the final recording substrate occurs both in image areas and in nonimage areas of the final recording substrate.

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~~93.~~

A process according to claim 37 wherein transfer of the intermediate transfer material to the final recording substrate enables control of the gloss characteristics of the final recording substrate.

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A process according to claim 37 wherein transfer of the intermediate transfer material to the final recording substrate enables control of the transparency characteristics of the final recording substrate.

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A process according to claim 36 wherein the final recording substrate has two major surfaces, and wherein marking material is transferred from the intermediate transfer member to only one of the major surfaces.

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96.

A process according to claim 36 wherein the final recording substrate has two major surfaces, and wherein marking material is transferred from the intermediate transfer member to only both of the major surfaces.

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